BIOQUELL

MICROFLOW

ADVANCED BIO SAFETY CABINET (ABS)

CLASS I

USER MANUAL

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Caution:

Please read this Manual thoroughly before attempting to use this unit. If you do not understand or are unsure of any information contained in this Manual please contact your Agent or BIOQUELL for clarification.

BIOQUELL designs, manufactures and supplies a broad range of containment and airflow products, as well as bio-decontamination solutions for:

- Rooms
- Systems and processes
- Laboratory equipment
- Biomedical equipment

For further information and contact details refer to our web site www.bioquell.com

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1 FOREWARD

This manual has been specially prepared to give guidance in the use and maintenance of the:

MICROFLOW
CLASS I
ADVANCED BIO SAFETY CABINET (ABS) Mk II

WARNINGS:

(1) USE OF THE CABINET IN A WAY OTHER THAN DESCRIBED IN THIS MANUAL COULD PROVE TO BE VERY DANGEROUS.

(2) GERMICIDAL LAMP. EMITS UV RADIATION 253.7 nm. EXPOSURE WILL CAUSE DAMAGE TO SKIN AND EYES. VACATE AREA WHEN IN USE.

A list of Safety Symbols used on the Cabinet labels is provided in Section 17.

In order to utilise the full operator protection factors given by the cabinet, it is essential that the operator is fully familiar with the cabinet and all of its functions and controls. This manual should be thoroughly studied before the cabinet is used.

This manual contains the operational and first line maintenance instructions. Service and maintenance operations other than those covered by this manual should only be undertaken by BIOQUELL's recommended service agent, see Section 16.

Care should be taken to follow the instructions in this manual to ensure safe operation. However, if further clarification is required contact your supplier.

1.1 SAFETY ENVIRONMENTAL CONDITIONS

The cabinet is for indoor use only.

The unit is safe to run electrically between 5°C and 40°C at 10 to 80% humidity, however the unit ought not to be operated outside a temperature range of 10 to 35°C for it to give the designed operator protection.

Installation category (overvoltage category) II (BS 7671).

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2 INTRODUCTION AND PRINCIPLE OF OPERATION

The Microflow Cabinet is the result of many years of experience in the development and use of Safety Cabinets and should give long and trouble-free service provided these simple instructions are followed.

The Microflow ABS Class I Cabinet (Mk II) has been designed to EN 12469:2000, which provides operator protection for handling organisms This is achieved by constantly taking air from the room into the cabinet and then exhausting it out through a HEPA filter.

The mean inflow must be between 0.7 and 1.0 m/s to ensure operator protection is maintained. If the airflow should fall outside these limits the cabinet will alarm

The cabinet can be either a ducted version, where all the air is exhausted out of the cabinet up a duct at the end of which the fan is located. The cabinet can control the fan to maintain the correct airflow rate if supplied by BIOQUELL. The alternative version re-circulates the air back into the laboratory after passing through two exhaust filters, note this configuration is not covered by EN12469:2000.

This Cabinet is suitable for working with Category 1, 2 and 3 pathogens

The airflow patterns are shown below in figures 1and 2, along with the sample points.

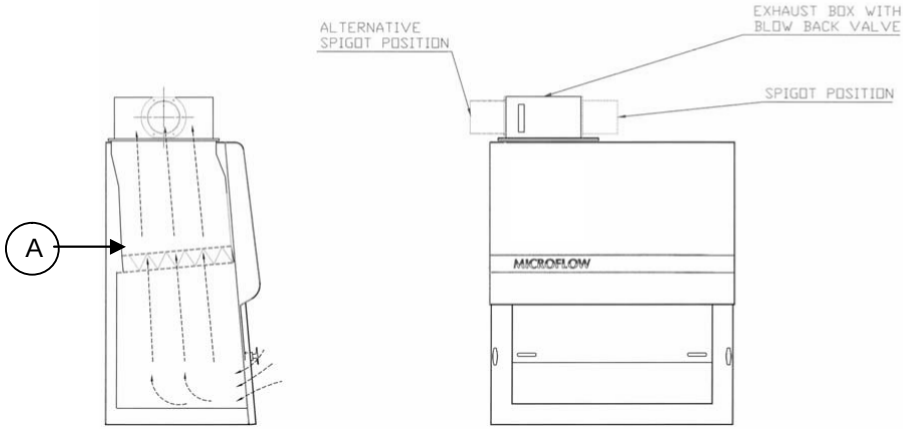


Figure 1 ABS Class I Ducted Cabinet, showing airflows and profile

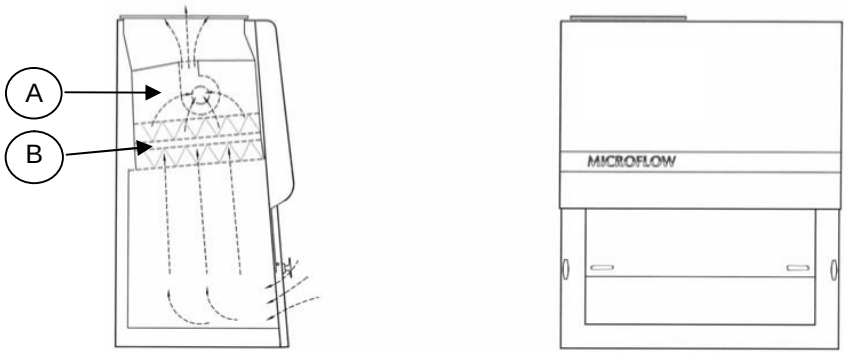


Figure 2 ABS Class I Re-circulatory Cabinet, showing airflows and profile

2.1 RESPONSIBILITY OF THE USER

It is not possible to detail all the Safety requirements for every procedure undertaken inside a Safety Cabinet. It is the responsibility of the user to ensure safe and proper techniques. Contact BIOQUELL for advice if required.

3 SPECIFICATION

3.1 OPERATING ENVIRONMENT

The cabinet will operate satisfactorily in environments where the ambient temperature lies between 10 and 35˚C. Condensation of moisture on the cabinet must be avoided at all times, as this will affect filter efficiency.

3.2 CONSTRUCTION

The outer shell is of mild steel sheet finished in white powder coating. The work area is made from 316 stainless steel, with the sides and rear powder coated.

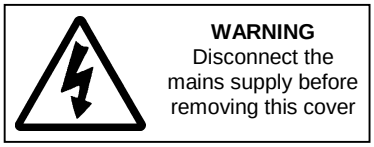
3.3 DIMENSIONS/WEIGHT

	1.0 m CABINET	1.2 m CABINET	1.5 m CABINET
Height (mm) Ducted (including top box)	1580	1580	1580
Height (mm) Re-Circ. (no top box)	1380	1380	1380
Depth (mm)	748	748	748
Width (mm)	1190	1390	1690
Weight (kg) Ducted Re-circulatory	 180 190	 210 220	 230 240

The maximum load of 25kg which can be placed on the cabinet floor with a foot print of 300mm by 300mm. Large point loads must be avoided.

3.4 ELECTRICAL

Always disconnect the mains supply before removing any cover displaying the following label:



The ABS cabinet requires:

(a) 230 V ±10%, 50 Hz single phase supply.

Power (W)	1.0 m CABINET	1.2 m CABINET	1.5 m CABINET
Ducted*	0.78kW	0.80kW	0.81kW
Re-Circulatory	0.78kW	0.80kW	0.81kW

* Includes standard external fan at end of duct run

The internal control system operates at 5 V.

3.5 WORKING AREA

The working area is made of high grade (316L) stainless steel. The table below gives the working area for the different cabinet sizes:

	Height (mm)	Width (mm)	Depth (mm)
1.0m Cabinet	635	1000	530
1.2m Cabinet	635	1200	530
1.5m Cabinet	635	1500	530

The safe working area is shown on the label on the front of the unit, and is all the internal working area.

3.6 NON RETURN VALVES (DUCTED)

A Non Return Valve is located after the HEPA exhaust HEPA filter(s) in the 'top box' plenum. This is to stop 'blow-back' and may not be 100% gas tight, but there will be no leakage of vapour if operated at negative pressure when being de-contaminated. The 'top box' may be turned so that the exhaust ductwork may be taken either from the right or left hand side.

3.7 ALARMS

Safety has been considered the primary factor in the design of this cabinet. Consistent with this, an alarm condition will be indicated when the following conditions occur:

Alarm / warning event	**Text message**	**Action**
If fan/ventilation enabled and the mask time expired and the inflow airflow more than calibrated/alarm limit.	Warning: Inflow high	Disables optional gas solenoid.
If fan/ventilation enabled and the mask time expired and the inflow airflow less than calibrated/alarm limit.	Warning: Inflow low	Disables optional gas solenoid.
If front screen open and left hand side unlatched.	Warning: screen LH unlatched	Warning only
If front screen open and right hand side unlatched.	Warning: screen RH unlatched	Warning only
If the speed of the exhaust fan required to maintain the inflow at the calibrated setpoint is greater than 80% of full speed.	Warning: replace filters	Warning only
If fan/ventilation enabled and the front screen is locked shut.	Warning: screen	Warning only

Alarm / warning event	Text message	Action
	locked shut	
If fumigation cycle aborted.	Fumigation cycle ABORTED	Warning only
If fan/ventilation enabled and the mask time expired and exhaust airflow sensor not connected or greater than maximum limit.	Warning: Flow sensor failure	Disables optional gas solenoid.
If screen right hand side latched in lower position and the left hand side unlatched.	Warning: Screen shut LH unlocked	Warning only
If fan/ventilation not enabled and the front screen (window) not shut and latched in the lower position.	Fan off, Window open	Warning only
If service due date exceeded.	Service overdue	Warning only
If battery backed data not retained after power failure. Note this would denote a loss of all calibration setpoints.	Fan 100% Battery Fail	Fan runs at full speed

All alarm/warning events will be displayed on the LCD as a text message.
The red alarm indicator will flash and unless muted by pressing the Mute button the buzzer will emit a two-tone sound.

3.8 LIGHTING

Fluorescent tubes provide a lighting level in excess of 750 Lux over the working area.

3.9 FILTRATION

High efficiency filtration is provided by narrow pleated HEPA filters meeting the requirements of class H14 or higher of EN 1822-1.

3.10 CONFIGURATIONS

Description	'Top Box' Plenum	Integral Exhaust Fan	Double Exhaust HEPA Filter	Flap Valve	Remote Exhaust Fan Required
Ducted	X			X	X
Re-Circulation		X	X		
Integral Bypass	X			X	X

Integral Bypass – Cabinet as Ducted version but with room air intake when cabinet not operating, the room air can be either HEPA filtered or straight from the room

4 INSTALLATION

WARNING:
INSTALLATION SHOULD ONLY BE CARRIED OUT BY TRAINED AND APPROVED ENGINEERS OR AGENTS.

BIOQUELL OR ITS AGENTS CANNOT ACCEPT RESPONSIBILITY FOR DAMAGE, LOSS OR INJURY CAUSED BY, OR RESULTING FROM, INCORRECTLY INSTALLED EQUIPMENT.

WARNING:
DO NOT USE THE PEROXIDE BLOCK OR PIPES FOR LIFTING.

4.1 POSITION OF THE CABINET

The correct functioning of a Safety Cabinet can only be achieved if the Cabinet is properly installed. The position of the Cabinet in the Laboratory is important. Advice on the correct location of Cabinets is given in 'The Code of Practice for Prevention of Infections in Clinical Laboratories and Post Mortem Rooms' published by HMSO and BS EN 12469:2000 and BS5726:2000. The following points should be observed in selecting the position for the Cabinet:

(a) Is the room of adequate size? About 25 cubic meters (900 cubic feet) is generally considered to be the minimum for ducted cabinets unless special provision is made for make-up air.

(b) Is the make-up air adequate?

(c) Will the Cabinet be subject to cross movements of air generated either by open windows, the ventilation system, exhausts from re-circulation cabinets, or doors being opened and closed near the Cabinet?

(d) Is there space behind the operator movement of other staff without disturbing the air flow patterns?

It is recommended that a smoke test be performed in the laboratory where a Cabinet is to be sited to ensure that there are no adverse movements of air. A smoke test should also be conducted after the Cabinet has been installed to check the air movements and room pressure while this Cabinet is running.

4.2 POSITION OF THE FAN FOR DUCTED CABINETS

The Fan should be positioned at the exhaust end of the ductwork which should terminate outside, thus ensuring that internal ductwork is kept under negative pressure. Should it be necessary to install the Fan inside the building then the ductwork from the Fan to the outside of the building must

be kept as short as possible and never longer than two metres. Ductwork should be constructed from a smooth non-porous material, e.g. rigid PVC. The length of the ducting should be kept as short as possible; the fan must be sized for the duct work and an additional pressure drop from the cabinet. The following table gives the pressure drop and the flow volumes the duct work must be designed to.

	Ducted Cabinet Pressure Drop (Pa)	Integral Bypass Pressure Drop (Pa)*	Min. Airflow (M^3/hr)	Normal Airflow (M^3/hr)	Max. Airflow (M^3/hr)
1.0m Cabinet	250	450	485	588	691
1.2m Cabinet	280	480	585	710	835
1.5m Cabinet	590	550	735	895	1051

* With or without HEPA filter

The remote fan must be able to be set at the airflows given. Bioquell can supply a fan designed to be controlled from the cabinet.

The cabinet can control a third party fan which is powered by a single phase 230V motor of maximum power of 400W and is suitable for Phase Angle control. Alternatively an inverter drive system can be used as long as it can accept a 4-20mA speed control signal, for this an additional board is required to be fitted in the cabinet. Where more than one cabinet is using a common duct a Constant Volume Damper will be required and whenever an integral Bypass is installed.

It is recommended that 160 mm nominal diameter rigid PVC ductwork is used except where the duct work is excessively long or has multiple bends. The connecting spigots on both the Cabinet and Fan Box have been manufactured to match this diameter of ductwork so the connections may be made using soft PVC sleeves that slide over the ducting and the spigot and are retained by stainless steel bands.

NOTE to change the filters the 'top box' plenum has to be raised vertically by a minimum of 20mm, as a result the duct work must have a flexible connection to cater for this.

4.3 PREPARATION FOR USE

In order to utilise the full operator protection factors given by the cabinet, it is essential that the operator is fully familiar with the cabinet and all of its functions and controls. This manual should be thoroughly studied before the cabinet is used.

When commencing use, the following procedure must be followed for safe operation; abbreviated instructions are shown on the Control Panel:

(a) Plug in the power lead, if applicable. Switch on power at the switch located at the power entry point.

(b) Confirm that the blue LED on the control panel is lit, indicating that mains power is applied to the cabinet.

(c) Press and hold down the 'TEST' button. All LEDs on the keypad should light and the buzzer should sound. If not, the cabinet should not be used and maintenance advice sought.

(d) Open the window to operating position (see section 5.2) and press the 'FAN' button, if prompted enter PIN number. The fan will take about 1 minute to stabilize, during this period the alarms are muted.

(e) It is possible that after the stabilising process, the buzzer sounds and the display advises of an airflow alarm. The possible causes are as follows:

(i) The first time the cabinet is switched on following a maintenance operation involving use of the set up software.

(ii) The environment of the cabinet is at the extremes of its operating temperature (10 - 35˚C).

(iii) If the cabinets airflow pattern has been recently disturbed.

In any of these cases, the alarm can be expected to clear and after waiting a few extra seconds.

(f) If an airflow alarm is still displayed after 3 minutes from switching on the cabinet, the unit should not be used and advice sought from your Safety Officer or Supplier.

5 OPERATION

5.1 CONTROL PANEL

The touch controls are located on the Control Panel (Fig. 3) and are described in the following paragraphs.

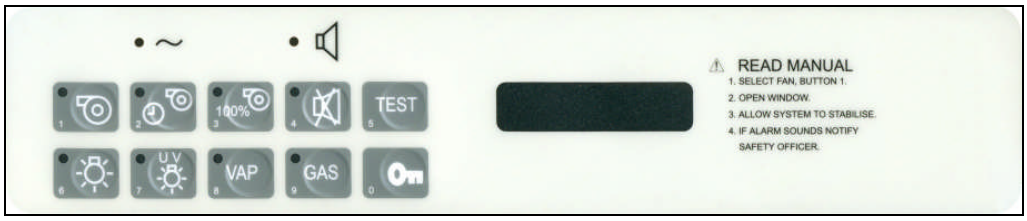
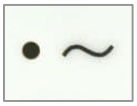


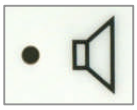
Figure 3 Control Panel (for illustration purposes only)

5.1.1 Mains Power Indicator



The blue indicator is lit when the mains supply has been connected to the cabinet. The indicator remains lit at all times.

5.1.2 Alarm indicator



The alarm indicator flashes whenever an alarm condition occurs. Additionally, unless muted by pressing the MUTE button, the buzzer emits an alternating two tone signal to give warning of an alarm condition.

5.1.3 Fan Control

Operation of this switch causes the cabinets internal or external fan together with the airflow control system to operate. Alarms are muted for a period of about 1 minute during which time the display will show the message 'STABILISING FLOW'. If after this time no alarms are active the correct airflow will have been established and the display will show an appropriate message, for example 'CABINET SAFE'.

A second press of the fan button causes the fan(s) to be switched off. Alternatively, one of the other fan controls, or the vaporisation cycle can be selected to provide the desired action.

5.1.4 Fan Off Delay

Pressing this button when the fan has been running (LEDs of buttons with numbers (1) or (3) lit) will cause the fan to be switched off after expiry of a timed period.

The delay period is configurable from the set-up software. See Section 10 'Control System: Customisation and Calibration'.

Pressing this button a second time cancels the remaining delay time and switches off the fan(s).

Once the fan delay is activated, it can alternatively be cancelled by pressing either of the other two fan functions: buttons (1) or (3). This will initiate the relevant function

5.1.5 Fan 100%

Pressing this button will cause the cabinet's internal or external fan to operate at full speed. This facility is intended for emergency use after a spillage or other inadvertent activity

A second press of this button will switch the cabinet's internal or exhaust fan off. Alternatively, either of the other two fan buttons can be pressed in order to select the desired action.

5.1.6 Alarm Mute

When an alarm condition occurs, the buzzer will sound. Pressing this button will cause the buzzer to be muted for a configurable time period of between 0 and 255 minutes. See Section 10 'Control System: Customisation and Calibration'. The default setting is 4 minutes. Cabinets to BS EN 12469 require the default setting at 0 minutes.

The intermittent beeping that accompanies: 'FLOW STABILISATION', 'EXPIRED SERVICE DATE' messages, or attempts to select incompatible conditions are not muted.

5.1.7 Test

Correct operation of button indicators and the audible alarm may be checked by pressing the 'TEST' button; all indicators should light and the buzzer should sound with a continuous tone.

The 'TEST' function serves the secondary purpose of allowing the 'HOURS RUN' and 'SERVICE DATE DUE' information to be displayed. This data is useful in the planning of maintenance operations.

5.1.8 Fluorescent Lights

Pressing this button turns on the cabinet's fluorescent lighting. With power connected to the cabinet, the lights can be switched on at any time.

If UV lamp is in use or the UV lamp switch has been pressed (UV lamp switch LED lit), it will automatically be switched off when the fluorescent light is selected.

5.1.9 UV Lamp

WARNING:
DUE TO ITS HAZARDOUS EFFECTS, THE CABINET OPERATOR SHOULD AVOID ANY EXPOSURE TO UV RADIATION.

When selected, the UV lamp will remain on for a configurable time period after which it will automatically switch off. The default setting is 15 minutes.

The time period for which the UV lamp remains on can be changed, see Section 10 'Control System: Customisation and Calibration'.

5.1.10 Vaporisation Cycle

Pressing this button initiates the decontamination process. See Section 7 'Decontamination of the Cabinet' for the procedure.

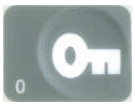
5.1.11 Gas Supply

As a safety feature, in series with the gas supply tap is a solenoid valve, which is controlled from the control panel. Thus, the gas supply can only be selected if the airflow is in a safe condition (i.e. no alarms are active). Once the valve has opened, gas supply can be controlled via the tap inside the cabinet in the usual way.

Caution:
The solenoid valve will automatically close the gas supply, if an alarm occurs during the time it is selected.

5.1.12 Keylock and PIN Number Change

Keylock



This button provides the facility to lock the buttons associated with fan control. Then when ever the fan control is to be altered, e.g. turn it OFF or ON the PIN must be entered. This is a requirement under EN12469, but the units are shipped without this facility activated, see below.

PIN Number Activation and Change

Pressing the button followed by entering the appropriate PIN (default 1111) will prompt the user to either Change the PIN or Lock the Cabinet. If Lock the cabinet is chosen then it is necessary to press the keylock button and enter the PIN and unlock the cabinet before the fan can be operated.

5.2 SLIDING WINDOW AND FAN OPERATION

The cabinet has a sliding screen which produces a complete seal when shut. This negates the use of a night door when de-contaminating.

To open the Front Sliding Window from the closed position:

The cabinet will be displaying the following message: 'WARNING Screen locked shut'. Release the door frame by turning the two black 'T' handles on either side of the window, a half of a turn anti-clockwise. The frame will

move 20 – 30 mm outwards. It is important the both 'T' handles are turned, so that the red dot is at the top (Figure 4). The cabinet will start to alarm with the following message 'WARNING: LH Unlatched' and 'WARNING: RH Unlatched'

Figure 3
Window frame closed
Red dot at bottom

Figure 4
Window Frame released
Red dot at top

With both sides released the glass window can be moved using the handles on the glass up to the operating position. As the window is raised the fan will start to operate if it was not previously turned off. When the glass reaches the operating position a stop will prevent it from being raised any further, in addition there is a label indicating where the bottom of the glass ought to be.

Then push the window frame inwards and turn the two 'T' handles clockwise half a turn to re-secure the window onto its seal (figure 3).

If the window is not at the correct height or the two 'T' handles have not located correctly, the following alarm messages will continue to be displayed 'WARNING: LH Unlatched' and 'WARNING: RH Unlatched'.

The fan can now be started by pressing the Fan button on the keypad .It will take approximately a minute to stabilise and will display 'STABILISING FLOW', then the following message is displayed 'CLASS I SAFE' stating that the cabinet is safe.

To close the window carry out the same procedure in reverse, turning off the fan first by pressing the fan button. The cabinet will alarm when the 'T' handles are released and the fan will stop when the window is shut, if the fan button was not pressed (not recommended).

The Front Sliding Window may also be hinged (Figure 5), allowing access into the cabinet for cleaning the inside surface of the window, or for loading equipment into the cabinet. With the window frame hinged out the window itself can be raised higher. To hinge open the widow pull outwards the window frame until it stops, then let it back slowly, the window will then hold open. To shut it again, pull the window frame fully open again, and it will unlatch allowing it to close.

Figure 5
Window hinged open for increased access and for cleaning

Caution:

Care must be taken to avoid impact damage to the bottom edge of the Front Sliding Window as cracking of the glass may result.

When wishing to leave the cabinet the fan can be switched off by pressing the fan button (recommended), or the window can be closed which will also turn off the fan.

5.2.1 Integral Bypass Operation

The Integral Bypass, if fitted, works in the same way as described above but also works the room/cabinet change over damper as described below.

Power to the cabinet must be ON, If it is switched off or there is a power failure the integral bypass will always shut off the cabinet, taking air from the room.

To start the MSC the user should follow the procedure below:

- Enable the damper by pressing the fan button
- Damper will start to open
- The cabinet will prompt the user to open the window after a few seconds with a message 'Open Window' and the sounder will operate.
- Fan starts
- Cabinet will stabilise, this takes one minute
- The cabinet will then display 'SAFE MODE'

NOTE If the User opens the window then the cabinet will Alarm and the following message will appear 'Window Open Fan not On'

To switch off the Cabinet and extract air from the room

EITHER (recommended):

- Fan button can be pressed
- Cabinet will alarm, prompting the user to shut the window
- Damper will close off cabinet

OR:

- The window is shut
- Damper will close off cabinet

If the fan requires switching off and the window is required to remain open then this can be achieved without the Cabinet alarming with the following procedure:

- Fan Time delay button is pressed
- Cabinet continues to run for a pre-set time
- The damper will close off the cabinet

5.3 WORK SURFACE

The actual working surface is lower than its edges so that minor spillages will be contained.

5.4 CABINET MAINS POWER CONNECTION

Mains power connection to the cabinet is made by the use of a standard IEC 3 pin connector assembly incorporating dual pole fusing and an isolator switch (Fig. 6).

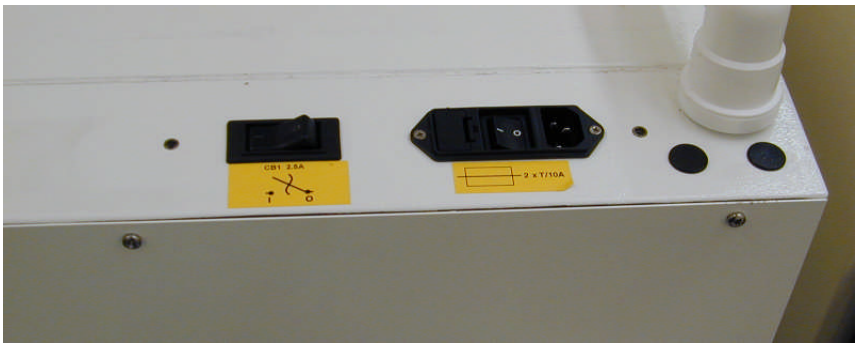


Figure 6 Mains Connector and Switch

5.5 SAFETY CONTROL FEATURES

5.5.1 Automatic Air Velocity Control

The control system automatically compensates the airflow for the dirtying of filters and variations in the mains power supply. Whenever the airflow is within safe operating conditions, the display reports the message 'CABINET SAFE'.

If an alarm condition is detected, the buzzer will sound and the alarm LED will flash; the cause of the alarm will be reported on the display.

After switching on the cabinet from cold, an airflow alarm may occur for a short period. This is due to the stabilisation of flow sensors and airflows. During stabilisation, the display shows the message 'STABILISING FLOW'.

5.5.2 Automatic Fan Start After Power Failure

In the event of power disconnection from the cabinet while the fan is operating, reconnection of the power will cause the fan to start. However, all other functions will be automatically set to off and, if required, they must be reselected. If Fumigating with Formalin the cycle will re-start automatically from the beginning of the phase it was in when the power disconnection occurred

5.5.3 Hour Meter and Service Date Due

These parameters can be viewed on the display by pressing the 'TEST' button.

6 OPTIONAL EXTRAS

Figure 7 Services: Double Electrical Sockets, Gas tap and Formalin Vaporiser inlet

6.1 SOLENOID OPERATED GAS INLET

Gases for use inside the cabinet are supplied via a solenoid valve (located behind the side panel) which permits gas to flow only when the cabinet fans are operating and airflow levels are within the specified parameters. Switch on the gas supply by pressing the button marked 'GAS' on the Control Panel. The gas flow can then be controlled at the tap.

6.2 MAINS SOCKET

A double mains socket (IP55) can be fitted to the side wall of the cabinet. Most cabinets are fitted with two similar electrical sockets. Equipment in excess of 300 W should not be connected to a socket, if this value is exceeded, the circuit breaker will trip. The circuit breaker is located on the top right of the cabinet adjacent to the mains connection socket and on/off switch, see figure 6.

Electrical safety test on the electrical socket has a maximum permitted earth leakage of 0.5 mA.

6.3 SERVICES TAP

In addition to the solenoid operated inlet, a second tap without an interlock valve is provided. This valve can be used to connect air vacuum or non-hazardous gas supplies to the cabinet.

6.4 HYDROGEN PEROXIDE CONNECTIONS

On Peroxide versions of the cabinet, connections designed to enable integration with a Clarus Hydrogen Peroxide Generator are fitted. This is used to de-contaminate the cabinet see section 7.

6.5 FORMALIN VAPORISER

A Formalin Vaporiser (Fig. 8) can be fitted to the cabinet to provide a convenient method for decontamination. The vaporiser can function as part of the integrated fumigation cycle. Refer to Section 7.

Figure 8 Formalin Vaporiser

6.6 FIREBOY GAS BURNER

This burner has been designed for use in Safety Cabinets and Laminar Flow Units and can be supplied with a foot-operated switch. The switch operates a solenoid valve allowing the gas to flow and at the same time initiates its ignition. The burner can either be set for a fixed time of operation or can be extinguished by pressing the foot switch a second time. The advantage of this type of burner is that the flame is only present when actually needed and so causes minimum disturbance to the airflow pattern within the cabinet.

6.7 TOUCH-O-MATIC GAS BURNER

This is a gas burner, which is operated by a palm control. The control is linked to the gas burner and operates a valve to allow passage of gas; a pilot flame in the burner ensures immediate combustion of the gas. The flame is extinguished by the release of the palm control and its size and intensity can also be varied.

6.8 STAND

For applications where bench space is not available for the cabinet, a stand is available with either adjustable feet or swivel castors. The height of the stand can be adjusted between 675 and 850mm in 25mm increments at installation to suit the operator. This gives a work surface height of 745 to 920mm. In addition there is a foot rest at the front which can be moved to also suit the operator.

6.9 VOLT FREE CONTACT

An option is available so that continuous remote monitoring of cabinet operating status can be performed. Interfacing to the cabinet is via a multi-way plug located on the top surface of the cabinet.

Parameters which affect the closing of relay contacts are:

(a) Cabinet fan on.

(b) Airflow alarm active.

Contacts are rated at maximum 1 A at 24 V a.c. or d.c. Refer to Fig. 9 for connection details.

DESIGNATION	CONNECTION	ALARM
A	N.O	Airflow Alarm On
B	N.C	
C	Common	
D	N.O	Cabinet Fan On
E	N.C	
F	Common	

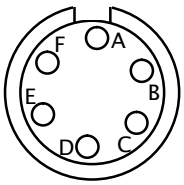


Figure 9 Volt Free Contact Wiring

6.10 INTERNAL SOCKET RESIDUAL CURRENT DEVICE

As an additional operator safety feature, a Residual Current Device (RCD) is available and, when fitted, is located adjacent to the circuit breaker and main ON/OFF switch on top of the cabinet, see figure 6. The device will isolate power to the socket if a difference in currents flowing along live and neutral conductors exceeds 30 mA.

To set (or reset) the RCD, push the black lever to the On position. It is recommended that the RCD is checked for correct operation before each time it is (re)set. To test, press the TEST button on the RCD once the black lever has been set to On; the black switch should then immediately go to the Off position.

6.11 U.V. LIGHT

The U.V. light is not recommended for use in Safety Cabinets in EN 12469:2000 and is an inappropriate method to de-activate category 4 pathogens.

Any surface that is not in contact with the direct UV rays will not be disinfected. This will include the rear and sides of the portable UV lamp assembly. Therefore when the lamp is removed it must be cleaned using a proprietary disinfectant.

The UV light transmission from the tube reduces with use, and thus the tube ought to be replaced regularly.

The UV light is operated on a timer of a default of 15 minutes. If the exposure to the UV light requires altering this can be easily done through the maintenance software, refer to your local distributor or alter with set-up software as described in section 10.4 Customisation of Controls.

WARNING:
DUE TO ITS HAZARDOUS EFFECTS, THE CABINET OPERATOR SHOULD AVOID ANY EXPOSURE TO UV RADIATION.

6.11.1 High Level U.V. Light

The high level U.V. light is permanently fitted and is operated by use of the U.V. light switch (see section 5.1.9). As a safety feature the internal fluorescent lighting must be switched off and the window shut, prior to switching on the U.V. light, otherwise it will not operate.

6.11.2 Portable U.V. Light

Place the Portable U.V. light at the front of the cabinet positioned centrally along its length. The power lead can then be connected to the socket (labelled 'UV') on the internal wall of the cabinet. Two safety related interlocks are incorporated into the circuit powering the UV lamp:

The front viewing panel must be fully closed, thereby achieving the alignment of a magnet on the window with a reed switch in the rear of the lamp casing. If alignment of the two components is not achieved, the lamp will not function. A series of holes on the rear of the lamp casing indicate the position of the switch; if the UV light does not work when expected, adjust its position slightly.

The fluorescent lights must be switched off. Unless these lamps are off, it will not be possible to switch on the UV lamp.

The U.V. light is operated by use of the U.V. light switch (see section 5.1.9).

6.11.3 Remote Start / Stop Switch

A remote start/ stop switch can be supplied to be fitted outside the room where the cabinet is fitted. This key switch requires turning momentarily to initiate the stopping of the fan and starting it, replicating the fan button. Note that the window on the cabinet must be in operating position otherwise the cabinet will alarm and not operate.

Note if an Integral Bypass is fitted the Fan time delay button must be used to switch to the room air, as this allows the window to be left open without the alarm sounding. If turned off at the remote keyswitch the alarm will not sound either.

7 DECONTAMINATION OF THE CABINET

It is recommended that the cabinet be kept clean and free of dust by swabbing down or washing down with a suitable disinfectant. Disposable gloves should be worn for this task. Do not use any Chlorine based cleaning agents.

The cabinet should be kept clean and free of unnecessary equipment.

Decomtamination would be necessary at the following times:

(a) Before carrying out any maintenance work.

(b) Before changing high efficiency filters.

(c) Before performance testing is carried out.

(d) Before moving, relocating or in any way disturbing the cabinet.

(e) Before instituting a change in the work program.

(f) After a gross spillage - as defined by your Safety Officer.

(g) To decontaminate any equipment or materials before their removal from the cabinet.

(h) Periodically as required by your Safety Officer.

7.1 SEALING OF RE-CIRCULATORY CABINETS PRIOR TO DECONTAMINATION

When using Hydrogen Peroxide to decontaminate a cabinet the exhaust must be sealed. The sealing plate should be placed onto the exhaust and clamped down using the 8 securing thumb nuts, see figure 10. Once the decontamination cycle has been completed the plate must be removed prior to starting the cabinet.

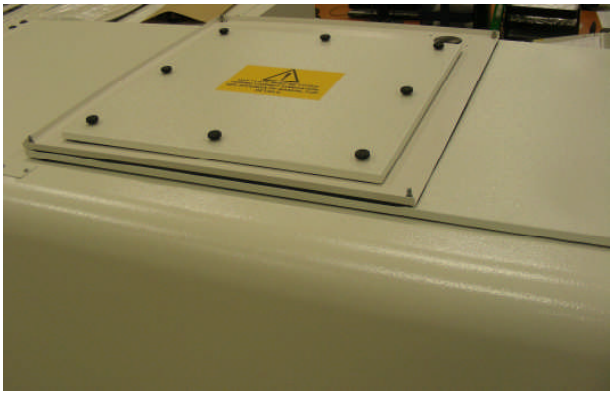


Figure 10 Showing the fitting of the sealing plate.

7.2 DECONTAMINATION WITH HYDROGEN PEROXIDE

This method of bio-decontamination requires a BIOQUELL Clarus Hydrogen Peroxide Gas Generator, alternatively the Bioquell EBDS Hydrogen Peroxide Bio-decontamination service.

The following instructions relate to the use of a 'Peroxide' Cabinet and a Clarus L2. A Clarus C can be used, refer to Bioquell for details. If the unit is not a Peroxide Cabinet the Bioquell EBDS service can still bio-decontaminate it with a simple site modification.

(a) Check that the cabinet is running in SAFE MODE.

(b) Release the window locks and pull the window down, the fans will stop working, then lock the window shut by use of the two 'T' handles on either side of the window.

(c) If the unit is Ducted ensure that it is safe to vent Hydrogen Peroxide through the duct work. If the unit is a re-circulatory cabinet then blank off the exhaust into the room, or attach a vent pipe to the outside for safe external ventilation or otherwise the Clarus can Aerate on its own, although this may take a long time.

(d) Connect the hoses, large diameter is supply and blue is return, and the pressure tube to the connectors on the rear of the Clarus L 2.

Connect the other end of the hoses and the pressure tube to the corresponding connectors on the right-hand side of the Cabinet as shown in Figure 11. The blue hose connects into the top connection and the large diameter hose in the bottom, with the pressure tube connected in the centre. Note for the Clarus L2 these connections are required to be 1.5". The cabinet is, as standard, supplied with 1" connections for decontamination using the BIOQUELL EBDS service.

Figure 11 Cabinet Hose and Pressure Tube Connection

There are two different types of cycles which are available, either a filter decontamination cycle which ought to be used if the filters are going to be changed or the filter integrity is to be broken for any other reason. Or there

is a workspace decontamination cycle which can be used to decontaminate the working area. This is a suitable procedure when general servicing of the cabinet is to be done, or a bio-decontamination is required between experiments to stop cross-contamination. The advantage of the workspace only decontamination is that it is significantly shorter.

Running a Filter Decontamination Cycle

a) Run a decontamination cycle with the Clarus according to the Clarus manual.

The following cycle parameters ought to be set for bio-decontamination of the filters.

Remote Start	OFF
Pressure Test Only	OFF
Test Pressure, Test Time, Test	decay, can be ignored
Aeration Only	OFF
Pressure Control	ON
Aeration Pressure Control	OFF*
Pressure Setpoint	-10Pa
Pressure Low Alarm	-80Pa
Pressure High Alarm	0Pa
Airflow setpoint	20 m3/hr
Delivery Temperature	60˚C
Conditioning Parametric	OFF
Conditioning Time	10 minutes
Gassing Time	25 mins for 1.0 &1.2m and 35mins for 1.5 & 1.8m
Gassing Injection rate	4 g/min
H2O2 Alert level	100ppm
Dwell Time	15 minutes
Injection in Dwell	No
Dwell Injection Rate	Can be ignored
Total Injection Limit	5%
Aeration VFC Delay	Can be ignored
Aeration Parametric	OFF
Aeration time	100 minutes
H2O2 Concentration	30%
Nozzle Alarm Enable	OFF

* If it is not possible to purge using the duct or vent pipe set to ON

When Aeration starts it is highly desirable to exhaust the peroxide through the duct work or temporary vent to atmosphere as the time taken to purge will be dramatically reduced.

CHECK WITH THE HEALTH AND SAFETY OFFICER FIRST. THERE WILL BE HIGH LEVELS OF HYDROGEN PEROXIDE IMMIDIATELY LOCAL TO THE EXHAUST OUTLET

If it is not possible to purge externally the Clarus L2 can carry out the Aeration. When it has been deemed safe through independent sampling of the cabinet's air the Aeration phase on the Clarus L2 can be completed and the cabinet returned to normal. Check the level of Hydrogen Peroxide in the cabinet by independent means, if below 1ppm the cabinet is safe to use.

Running a Workspace Decontamination Cycle

a) Run a decontamination cycle with the Clarus according to the Clarus manual.

The following cycle parameters ought to be set for bio-decontamination of the workspace.

Remote Start	OFF
Pressure Test Only	OFF
Test Pressure, Test Time, Test	decay, can be ignored
Aeration Only	OFF
Pressure Control	ON
Aeration Pressure Control	OFF*
Pressure Setpoint	-10Pa
Pressure Low Alarm	-80Pa
Pressure High Alarm	0Pa
Airflow setpoint	20 m3/hr
Delivery Temperature	60˚C
Conditioning Parametric	OFF
Conditioning Time	10 minutes
Gassing Time	8 mins
Gassing Injection rate	4 g/min
H2O2 Alert level	100ppm
Dwell Time	10 minutes
Injection in Dwell	No
Dwell Injection Rate	Can be ignored
Total Injection Limit	5%
Aeration VFC Delay	Can be ignored
Aeration Parametric	OFF
Aeration time	60 minutes
H2O2 Concentration	30%
Nozzle Alarm Enable	OFF

* If it is not possible to purge using the duct or vent pipe set to ON

b) With the window locked down start the Clarus L2 cycle.

c) After 28 minutes the Clarus L2 will be starting Aeration, it is highly desirable to exhaust the peroxide through the duct work or temporary vent to atmosphere by use of an Option B or C as the time taken to purge will be dramatically reduced.

CHECK WITH THE HEALTH AND SAFETY OFFICER FIRST. THERE WILL BE HIGH LEVELS OF HYDROGEN PEROXIDE IMMIDIATELY LOCAL TO THE EXHAUST OUTLET

To purge up the ductwork or temporary vent:

Open the cabinet's window to its normal working height slowly and lock in position. When the window is opened the fan will come on immediately.

WARNING THERE WILL BE HIGH LEVELS OF HYDROGEN PEROXIDE IN THE CABINET, CARE MUST BE TAKEN WHILE THE FAN IS STARTING AS SOME PEROXIDE MAY EXIT THE WORKSPACE. DO NOT FULLY OPEN THE WINDOW OR INHALE AIR FROM THE WORKSPACE UNTIL SAFE LEVELS OF PEROXIDE HAVE BEEN ESTABLISHED.

When the cycle on the Clarus L 2 has completed check the level of Hydrogen Peroxide in the cabinet by independent means, if below 1ppm the cabinet is safe to use.

No external Purge

If it is not possible to purge externally the Clarus L2 can carry out the Aeration, then the cabinet ought to be left in the same state as for gassing.

At the end of Aeration by the Clarus L2 the operator ought to check the level of Hydrogen Peroxide in the cabinet by independent means, if below 1ppm the cabinet is safe to use.

7.3 DECONTAMINATION WITH FORMALIN

Formaldehyde and Formalin are hazardous: observe handling procedures.

Ensure that the cabinet is free of Hydrochloric acid and other Chloro compounds. This will avoid the production of the carcinogenic product that results from the mixing of formaldehyde and HCl or Chloride gas.

The following procedure is provided for guidance purposes only; your Safety Officer should be consulted for definitive guidance.

Formaldehyde penetrates poorly and its effectiveness is dependendent on temperature and humidity. It is most effective above a temperature of 20°C and a relative humidity of 65%. Use of excessive amounts can result in polymer deposition within the cabinet and may contribute to filter blockage.

7.3.1 Fumigation with an Integral or Separate Fumigation Unit

If a stand alone separate fumigation unit is used, which is then plugged into the internal socket, the same procedure can be followed as described below, but the vaporiser unit will have to be turned on manually.

A safe manner to exhaust the fumigant is required, the following are a list of common methods:

- Use the existing Ducting for permanently ducted cabinets
- Fit temporary ducting to a central duct or other exhaust system
- Fit a Formalin Evacuation unit to the exhaust, a small portable unit designed specifically for this purpose, available from BIOQUELL.
- Use an in-built filter for removing the vapor, only fitted to Option K versions of the cabinet, refer to section 7.2.2

The cabinet display prompts the user throughout the fumigation cycle.

A safety feature built into the control system is that if the Window is disturbed during the evaporation or fumigating processes, the fan will automatically be switched on in order to safely expel the fumigant up the duct work. It is therefore most important the extract duct work is fitted prior to the start of the cycle. In such a situation the fan will continue to run until the Keylock button is pressed and the fumigation PIN number has been entered for a second time.

The recommended quantities of the solutions used in the following procedures are:

SOLUTION	1.0 m CABINET	1.2 m CABINET	1.5 m CABINET
Formaldehyde Solution 40% w/v (ml)	17	22	26
De-Ionised Water (ml)	17	22	26

Ensure that the ducting to expel the Formalin is secure to the exhaust plenum and that any manual valves are open.

Add the formaldehyde solution to the deionised water. This must be carried out in a fume cupboard or a Class I safety cabinet (ducted outside).

Remove the cap of the vaporiser, add the diluted formaldehyde solution and replace the cap.

Press the VAP switch and enter 2222 (PIN number).

Close the cabinet window and lock the 'T' handles shut. The vaporiser operates automatically and takes approximately 30 minutes to evaporate the contents.

The sterilising cycle is set at 240 minutes. After this time the cycle changes to 'Purging' (set for 480 minutes).

When the fumigation cycle is complete the display will show the following alternating messages 'Fumigation cycle Purging required' and 'Please open Class I window'.

The operator ought to open the window, or if a Formaldehyde Extraction Unit is being used switch it on first for 10 to 15 seconds and allow the unit to run for the purging time.

Periodically check the room with a formaldehyde meter (this should read less than 2 ppm formaldehyde).

Purging will continue until the purge time has expired. The cabinet will then return to normal cabinet functions.

Remove the temporary duct/Evacuation unit (close the orange valve first) as appropriate and run the Cabinet as normal and check the room with a Formaldehyde Meter.

A description of the cycle is provided in Table 1.

Table 1 Fumigation Ducted Cycle

ACTION	PROCESS	DISPLAY MESSAGE
Lock shut window, and pour formalin into vaporiser Press VAP	Start Cycle	'Enter PIN Number'
Enter four digit Number.	Vaporiser powered to evaporate formalin. (turn on manually if unit is not integral) Vaporiser powered for xx* minutes.	'Evaporation: xx mins to run'
	Formalin sterilises inside of the cabinet.	'Fumigating xx mins to run'
	Fan circulates fumigant for one 5 second phases	'Circulating'
	Fumigation completed	Alternating messages: 'Fumigation cycle Purging required' and 'Please open Class I window'
Open Window	Fan will start to purge fumigant from cabinet. When purge time is expired, the cabinet will resume normal operation.	'Purging xx mins to run'

* 'xx' Denotes a preconfigured time which counts down in minutes. The defaults are: Evaporation 30 minutes
Fumigation 240 minutes
Purging 480 minutes
These defaults can be changed by use of the Set-up software.

7.3.2 Automatic Fumigation (Option K)

The Option K units have a special activated Carbon Filter designed to remove Formalin vapor. The cabinet also automatically progresses through the fumigation cycle. Each stage is displayed with time to run in minutes.

7.3.2.1 Running an Automatic Cycle

Add the formaldehyde solution to the deionised water. This must be carried out in a fume cupboard or a Class I safety cabinet (ducted outside). Refer to the table in section 7.2.1 for quantities.

Close the front window and tighten both handles and lock. If re-circulatory secure blanking plate over exhaust as described in 7.1.

A notice should be attached to the cabinet to indicate that the fumigation cycle is operating. THE CYCLE MUST NOT BE STOPPED. The fumigation cycle will not commence unless the window is detected as being locked.

Ensure that the cabinet is free of hydrochloric acid and other chemicals that may contain chlorines.

Remove the cap of the vaporiser, add the diluted formaldehyde solution and replace the cap.

Press the VAP switch and enter 2222 (PIN number).

The cabinet will then display ‘Fumigation Cycle No X’. X counts from 1 to 10. If run again after the 10th cycle the following message will be displayed, ‘Maximum cycles for filter reached’, and the unit will not run any further cycles until the filter has been changed and the counter reset, see section 7.2.2.2.

‘Evaporating X minutes to run’ will be displayed. The vaporiser operates automatically and runs for the set time ‘X’ to evaporate the contents. A warning is displayed not to open the window.

The unit will then progress into fumigating with displaying the time to run and repeating the warning not to open the window.

Finally the purging stage starts with a repeat not to open the window on the display. This is where the vapor will be automatically circulated through the filter where the formalin vapor is scrubbed out.

When the cabinet has finished the cycle it displays the following message ‘Fumigation cycle No X complete’, where ‘X’ is the number of cycles run with a particular filter. The fumigation cycle should be stopped by using the VAP switch and entering the PIN, and then the blanking plate ought to be removed and replaced with the spigot. Only then the window ought to be unlocked and the cabinet set to normal operation.

To abort the cycle at any point press the VAP key then enter the PIN and press the Fan button to start the cabinet.

A description of the cycle is provided in Table 2.

Table 2 Automatic Fumigation Cycle

ACTION	PROCESS	DISPLAY MESSAGE
Lock shut window, Fit blanking plate and pour formalin into vaporiser Press VAP	Start Cycle	‘Enter PIN Number’
Enter four digit Number.	Vaporiser powered to evaporate formalin. Vaporiser powered for xx* minutes. Formalin sterilises inside of the cabinet. Fan circulates fumigant for one 5 second phases Fumigation completed Filter fan will start to purge fumigant through activated carbon filter.	‘Evaporation: xx mins to run’ ‘Fumigating xx mins to run’ ‘Circulating’ ‘Purging xx mins to run’

ACTION	PROCESS	DISPLAY MESSAGE
Press VAP & re-enter password Remove blanking plate and open window	Purge time expired. Cabinet returns to normal operation	'Cycle complete' 'WARNING Screen locked shut'

* 'xx' Denotes a preconfigured time which counts down in minutes. The defaults are: Evaporation 30 minutes
Fumigation 240 minutes
Purging 480 minutes
These defaults can be changed by use of the Set-up software.

Caution:

The operation of the automatic fumigating system does not require ventilation to an exhaust system, however, IT IS NECESSARY TO PROVIDE VENTILATION FOR THE ROOM. It is recommended at least two air changes per hour, this will ensure that all traces of formaldehyde are removed from the room.

7.3.2.2 Carbon Filter Changing

The carbon filter will complete a maximum of ten fumigating cycles as indicated on the cycle counter at the beginning and end of every cycle, after which it ought to be replaced. The filter is replaced by slackening the four screws clamping the filter in place, then lifting the top half up and sliding out the filter. To fit the new filter, follow the procedure in reverse.

On fitting a new carbon filter, the cycle counter will require resetting in the following manner:

(a) Press the key switch and enter the VAP code 2222.

(b) Select 2, reset cycle counter to zero.

The removed carbon filter will be contaminated with formaldehyde. Handling of the filter will require suitable personnel protection equipment, consult your Health and Safety Officer.

Environmental regulation for the disposal of such material may be applicable, consult your Health and Safety Officer. The new carbon will be supplied with a sealable bag in which the used carbon filter should be put as it is removed from the cabinet.

7.4 GASSING THE LABORATORY

Should this be required at any time, full information for UK organisations is given in the Department of Health Memorandum 'Control of Outbreaks of Small-pox' 1975, and advice should also be taken from your Safety Officer.

Laboratories can be decontaminated using Hydrogen Peroxide with a Clarus generator or using the BIOQUELL Room Bio-Decontamination Service (RBDS). Alternatively Formalin may be used, but this methods has a significantly longer down time and associated additional hazards.

It should be noted that Formaldehyde vapour in normal dilutions will not affect any part of the cabinet or its controls.

Note:

It is the responsibility of the user to ensure that whatever means of cabinet decontamination is used, it is compatible with the material being handled and has been approved by the Safety Officer

8 MAINTENANCE

The Biological Safety Cabinets have been designed to give many years' trouble-free efficient service and to keep maintenance to a minimum. However, to ensure this, they must be regularly cleaned and checked.

A full maintenance service is offered by BIOQUELL. Overseas, this same service is offered by the BIOQUELL distributors.

In addition to this, however, operators should carry out the following procedures on a schedule agreed with the Safety Officer, so as to ensure that the cabinet is always in first-class working order.

8.1 DAILY/FREQUENTLY

(a) Keep the unit clean externally as well as internally. It should be wiped over with a damp cloth using a proprietary bactericidal solution. The front viewing panel should be kept clean so that the operator always has a clear view of work being performed inside the cabinet.

(b) Ensure that the audible alarm and all indicators are functioning by pressing the 'TEST' button. Any faults should be corrected before the cabinet is used.

8.2 WEEKLY/MONTHLY

In addition to the above the following checks should be carried out:

(a) Visually check for damage to the seal on the front of the cabinet which is compressed by the glass of the front window.

(b) Inspect all mains cables to the cabinet, or to any extras that may have been fitted, for damage or wear. In the event of any fault being discovered, contact a BIOQUELL approved service company.

8.3 ANNUAL MAINTENANCE, TESTING AND RE-CALIBRATIONS

It is recommended that the annual service visit is carried out by BIOQUELL or its local distributor. The service shall consist of the following:

a) Visually check the cabinet internally and externally for surface defects, cracks or other damage. Check the window and its operation and seals.

b) Extract duct work to be examined where practicable, for defects, cracks or other damage, if fitted, and that it is clearly labelled.

c) Check the anti-blow back, if fitted, is functioning and clearly visible.

d) All alarms to be checked and tested, and re-calibrate the exhaust airflow sensor if required.

e) Filter and seal integrity checked using DOP. If there are two exhaust filters they ought to be checked independently.

f) Air inlet velocity

g) Pre-filter changed if fitted

h) Full function and keypad test

i) KI discuss test is recommended.

8.4 FILTER SERVICING

WARNING: FILTERS MUST BE DECONTAMINATED PRIOR TO REMOVAL. WHEN REMOVED THEY MUST BE BAGGED AND DISPOSED OF IN A SAFE MANNER.

It is recommended that this done by a trained service provided.

8.4.1 Exhaust filter(s)

WARNING: The CABINET MUST BE SWITCHED OFF AND DISCONNECTED FROM THE POWER SUPPLY

The four nuts holding down the 'top box' or exhaust plate which is located on the top of the cabinet must be removed. Lift off or hold up the top box or exhaust plate.

Remove the screw at either side of the cabinet, which holds the front cover down. Then lift the front cover, and two teleprops on either side will hold it open. Lower the front sliding window to the closed position.

The exhaust filter(s) are large panel filters located just above the work area.

After replacing the filter put the top box back on and by clamping it down the exhaust filter will be sealed in position.

Lower the front cover by pushing it up allowing the tele-prop to unlatch. Secure the front cover with the two side screws.

8.5 FLUORESCENT TUBE REPLACEMENT

WARNING: The CABINET MUST BE SWITCHED OFF AND DISCONNECTED FROM THE POWER SUPPLY

Remove the screw at either side of the cabinet, which holds the front cover down. Then lift the front cover, and two teleprops on either side will hold it open.

Remove the ends off the tube by simply pulling away, and then unclip the tube from the holders. Place the new tube in the holders, place the end on and fit down and secure the front cover

8.6 UV TUBE REPLACEMENT

To change the tube pull off the end fittings unclip the the tube from the the holding clips. Place the new tube in the holder by doing the above in reverse order.

8.7 CIRCUIT PROTECTION

There are two fuses located next to the power entry socket (Note the 120V version does not have any fuses but an overload trip instead). To gain access to the fuses push the little tab in and pull the 'drawer' up and out. The two fuses are attached to the 'drawer'. Replace always with T10 Amp fuses.

Changing of any fuses on the control board must be carried out by a trained technician.

9 CARE AND CLEANING

9.1 BIO ORGANISM REMOVAL CLEANING

Special attention for cleaning must be given to the door seal. Thoroughly clean with disinfectant, then rinse well with sterile water.

All MSCs should be kept clean and free of unnecessary equipment. The interior should be swabbed after use with a suitable disinfectant. Phenolics, quarternary ammonium compounds and aldehydes can be use for disinfecting these surfaces. Users of chlorine compounds should be aware of their corrosive nature. The use of alcohols should be undertaken with caution because of the risk of fire. Heavy duty polyvinyl chloride (PVC) or rubber gloves which provide suitable protection for the hands and wrists which can be disinfected for re-use should be worn when cleaning MSCs.

At the selection of disinfectants occupational health aspects should be considered.

9.2 STAINLESS STEEL COMPONENTS

The internal work area's sides, back and work tray are made of stainless steel.

Liquids or vapours containing Chlorine are known to cause gradual staining of stainless steel. To avoid this, cleaning agents which containing Chlorine ought to be avoided, however if this is not possible then all surfaces should be thoroughly dried and all traces of the solution removed, the area should then be treated with a neutralising agent. Open vessels left inside the equipment which are likely to cause Chlorine vapours may also result in staining of the metal surfaces.

Should the surface of the stainless steel become stained, it may be cleaned by mechanical polishing and special treatment of the affected area.

Note:

When cleaning to remove bio organisms the method we recommend is to wash with 40% ethanol or equivalent in all poor access points, e.g. corner of liners, fold and recesses in the tray. It is important to ensure that full surface contact is achieved and the use of cotton buds is recommended.

9.3 PLASTIC COMPONENTS

Cleaning of the plastic items should only be carried out with mild detergent or chlorine based cleaning solutions. Care must be taken not to apply chlorine solutions to any stainless steel metalwork, as this will potentially cause staining.

Do not apply heat, abrasive materials, solvents or solvent wipes to the surface as this can cause irreparable damage.

9.4 PAINTED AND OTHER COMPONENTS

Caution:

Do not use water around electrical connections, switches etc.

To clean all painted and other components use a damp cloth and, when required, a liquid detergent.

Note:

Do not use abrasive cleaners. Do not use Chlorine based cleaning agents on painted surfaces.

10 CONTROL SYSTEM: CUSTOMISATION AND CALIBRATION

It is strongly recommended that BIOQUELL or a trained agent of BIOQUELL is used to customise, and calibrate the cabinet. To do this work a PC with appropriate operating system is required as well as the set-up software which is available from BIOQUELL.

10.1 INTRODUCTION

The microprocessor based control system used in the cabinet allows the user two main advantages over the conventional analogue system. These are:

(a) Cabinet functions can be customised to the user's requirements.

(b) Calibration can be performed remote from the cabinet itself, without the need to access electrical components located in a potentially hazardous compartment.

Executions of both of these tasks are made simple and quick with the use of dedicated set-up software obtainable form BIOQUELL.

10.2 COMPUTER AND CABLE REQUIREMENTS

Equipment required to run the set-up software comprises a communication cable and a Personal Computer (PC) with MS Windows™ installed and a serial port. The PC's monitor should support a screen resolution of at least the VGA standard.

Physical connection of the computer to the cabinet is now required by means of a suitable cable.

Serial Cable: 9 way male 'D' Connector to 9 way female 'D' Connector.

Serial Cable: 9 way male 'D' Connector to 25 way female ' D' Connector

USB – RS232 Converter Cable: 9 way male 'D' Connector to USB Connector

Connection to the controller (Cabinet) is via the 9 way female 'D' connector located under the front cover on the side of the electrical box.

The computer end of the cable should be connected to an available Comm. port. See figure 12.

The connector on the computer will thus be either a: -

9 way male 'D' Connector.

25 way male 'D' connector.

USB Port

Note: Important: The comm. port used to connect to the cabinet must be configured as either: COM 1 or COM2.

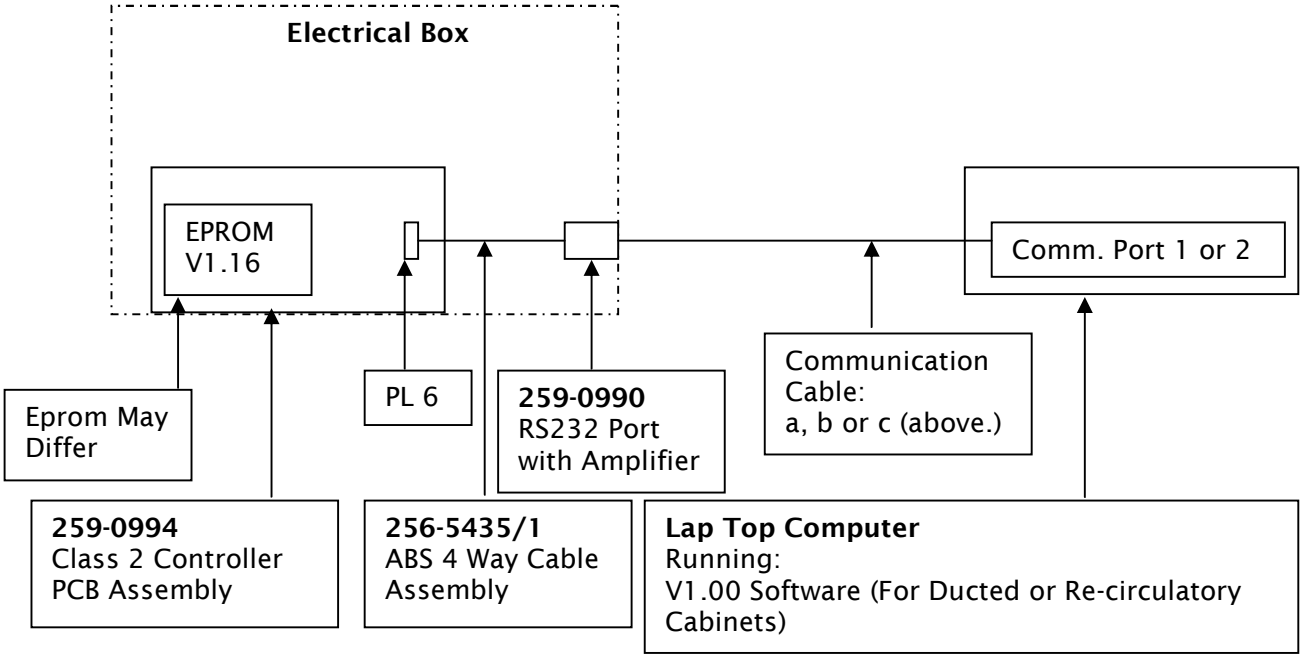


Figure 12 Communication Cable

10.3 INSTALLING THE SET-UP PROGRAM

To install the BSC Set-up program on the computer, use 'Explore' and install the program by selecting the file named 'Setup', in the same way that other programs are installed. To check if the operating system installed on the computer is compatible with the program refer to BIOQUELL.

After completing the installation, an icon will be created. Double click on the icon (a computer terminal labelled 'BSC') to run the Set-up programme.

The screen shown in Fig. 13 will be displayed. The screen layout has been designed for use with a variety of screen devices; for this reason, it should always be used in full screen mode or it is possible only part of the set-up blocks will be visible.

When starting the 'SET-UP' programme, should the error message 'COM 1 or COM 2 Unavailable', appear, Click 'comm. port' (See section 10.5.3) on the top menu bar and select the opposite to message displayed in the drop down menu.

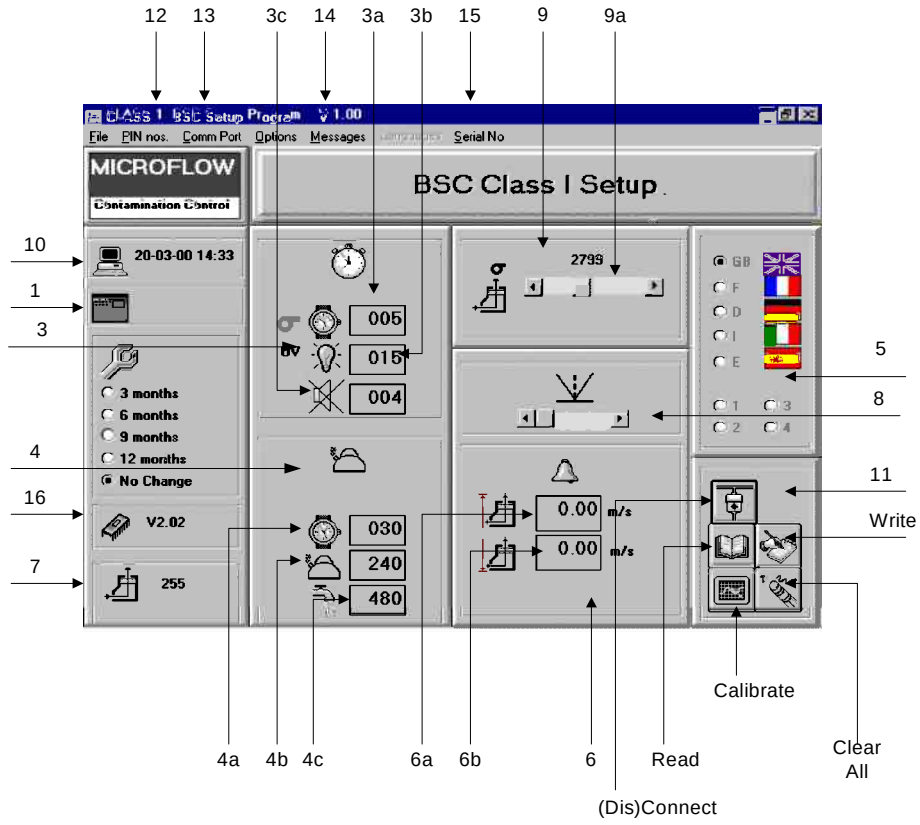


Figure 13 Typical Controller Set-up Screen

10.4 CUSTOMISATION OF CONTROLS

A number of parameters relating to the use of the cabinet can be customised according to individual preference or requirements; these consist essentially of: timer settings, updating of the controller clock, and language of the messages and prompts shown on the display. The numbers of the following descriptions relate to the features in Fig. 13.

Note:

Text in **bold** found in the following descriptions relates to options found in the set-up screen (Fig. 13); clicking the left mouse button with the pointing device on the symbol, its adjacent box or either of its buttons, (whichever is appropriate), will effect a routine or select the appropriate option.

1 Controller Clock

The controller clock is automatically updated whenever communication is established between the computer and controller. Ensure that the computer date/time is correct adjusting it, if necessary, using the date/time function. To update the clock, click on **Connect**. If all other operations are completed, break the computer/controller link by clicking on **(Dis)Connect**.

3 Timer Settings

The settings for the timers in 3a to 3c are changed by clicking in the appropriate box and then typing the required time. The time entered is in minutes for which the device is active. Values can range between 0 and 255 minutes for the mute timer and 0 to 999 minutes for other parameters. For further descriptions of the functions referenced, refer to Section 5.1 'Control Panel'.

3a Overrun timer

Pressing the 'FAN DELAY OFF' button causes the fan to continue running for the time period entered.

3b UV timer

Pressing the 'UV' button switches the UV lamp on for the time period entered.

3c Mute timer

Pressing the 'MUTE' button mutes the buzzer for the time period entered.

4 Vaporiser Cycle

The vaporisation cycle consists of sequential phases, with configurable durations of between 0 and 999 minutes. To change the settings, after **Connect**ing, click in the relevant box and edit as required.

If these are the only operations to be carried out, after amending the values, click on **Write**, followed by **Disconnect**.

4a On time

This is the time at the start of the cycle when the vaporiser heater is powered. Choose a suitable time to achieve evaporation of all of the fumigant solution, but not to run the heater needlessly. A thermostat will break (and reset) power to the unit if the evaporation temperature is exceeded. As a guide, if 22 ml of approximately 40% solution with an equal volume of water is being used, then 26 minutes should be an appropriate value for this timer.

4b Fumigation time

This is the time required for the fumigant to sterilise the cabinet internal surfaces and all installed components. Thus, choice of an appropriate value will depend on the sterilising agent, its concentration, and the nature of the source of contamination within the cabinet.

A figure of 240 minutes is suggested as a suitable value, assuming 40% solution Formaldehyde is being used.

4c Purge time

This is the time period following fumigation when the fan operates to extract the sterilising agent out of the cabinet. Again, careful consideration needs to be given to the choice of this value since an adequate time needs to be

allowed to ensure that all traces of the material have been removed. The following points should be remembered:

(i) Although the OES (Occupational Exposure Standard) may be satisfied and the presence of the fumigant is not detected by smell, the working area of the cabinet may still constitute a hazardous environment towards the material being processed.

(ii) Trials with the cabinet have found that concentration levels of fumigant within the cabinet when subjected to purging action (exhaust ducted outside laboratory), drop rapidly initially, but a disproportionate time is required for final reductions to the acceptable level.

(iii) A value for this time of 240 minutes has been found to be appropriate to bring concentration level within the currently published OES value (2 ppm). However, your Safety Officer should be consulted for definite guidance on this and other timer settings suggested.

5 Language

The messages displayed on the controller screen are in English. The option to select other languages is not available.

6 Alarms

The value at which alarm limits are to be calibrated are entered in the two fields 6a and 6b. On execution of a calibration process, it is the values entered or previously entered and stored, which the user is prompted to set in order that airflow alarms can be recorded by the controller.

The alarm values are stored as configuration files. How to **Save** and **Load** configuration files is described in Section 10.5.1 'File'.

The fields labelled 6a and 6b refer to alarm values (in m/s) of **high inflow and (low) inflow** respectively. To create a configuration file click the pointer in the relevant field, press the Delete key as required and enter the desired value. When all other desired parameters have been entered select **Save** as described in Section 10.5.1.2 'Save', to store the settings on the PC disk.

7 Sensor Output

Providing the **Show sensors** option has been selected from the **Options** menu, the fields adjacent to the symbols will display a numerical representation of the inflow sensor output values. The numbers displayed (between 0 and 255) proportionally relate, although not linearly, to the airflow over the respective sensor. Thus, observation of the values can be of assistance during: calibration, diagnosis of faults, and commissioning.

Note:
As a default, **Show sensors** is selected.

8 Setpoint Adjustment

This slider allows the controlled operating point of the cabinet fan's speed to be adjusted once calibration has been performed.

9 Fan Speed Adjustment

This control allows the speed of the main fan to be adjusted.

9a Main Fan Speed

Manual speed control of the cabinet's main fan can be achieved by use of the slider labelled 9a in Fig. 13. Manual adjustments may be necessary when a specific flow is required in the cabinet, but the use of this device is expected to be limited to occasions of testing and evaluation. To use the manual speed adjustment, the software should firstly be **Connect**ed, then manual control can be enabled by clicking on **Options** followed by **Direct Control**. Note that as a default, this option is selected.

Whenever the controller and computer are **(Dis)Connect**ed, the fan will initially operate at the speed that was previous set. The manual speed control slider is a method of dictating the preliminary speed setting from which achievement of the set point will be affected. Because controlling action is necessarily quite slow, the alarms points may be checked by employing suitable starting points for the fan and then enabling controller action by clicking on **(Dis)Connect**.

10 PC Clock

This field shows the time and date of the PC's internal clock. It is important that the PC's clock always reports the correct time and date as this is the reference used to (re)set the controller clock; whenever a connection is made between the two devices, the controller clock is automatically updated from the PC clock.

For security purposes, the controller has been programmed so that it will not accept a time update grossly behind its current reference.

10.5 MENU BAR

Facilities available from the top menu (refer to Fig. 13) are described in the following paragraphs. To display the possible options click with the pointer on the appropriate text. The available options will then be displayed in black text. Options not available will be shown in grey.

10.5.1 File

The **Load** and **Save** options allow sets of configurations to be stored on computer disc and retrieved for subsequent use. This therefore will save time entering values each time a cabinet is set-up or a series of cabinets are to be set to operate in the same way. However, since controller sensor values are not stored in the configuration file, it is essential that each cabinet is calibrated using the facility described in Section 11.4 'Calibration Procedure'.

10.5.1.1 Load

To load a configuration:

(a) Click on **File**, followed by **Load**.

(b) All files with extensions '.cfg' will be displayed; select the appropriate by double clicking on it or type its name in the **File Name** box. Click on **OK** or alternatively double click on the appropriate directory in the Directories or Drives boxes if it is stored.

(c) All the set-up parameters will then be displayed on the screen

10.5.1.2 Save

To save a configuration:

(a) Enter all the data in the relevant fields on the set-up screen

(b) Click on **File**, followed by **Save**.

(c) Type a path and file name in the **File Name** box. For easy management, the choice of a file extension '.cfg' is recommended; this will store all files of this type together and will display them each time a **Load Settings** selection is to be made.

(d) Click on **OK**.

If a configuration file is to be used on more than one cabinet, it should be saved on the computer's fixed disc. Thus the drive name and directory path should prefix the file name, e.g. C:\SETUPS\FILENAME.CFG. SETUPS is a directory specifically created for the storage of configuration files and FILENAME is a name for the file which facilitates easy identification, e.g. BS_12.

10.5.1.3 Exit

The **Exit** option can be used as an alternative to the close window ('-') button to terminate running of the set-up program.

10.5.2 PIN Nos.

Maintenance of the PIN numbers can be carried out by selecting **PIN Nos**. The PIN numbers are the four digit codes which allow the fan selections to be locked and also allows use of the vapourisation cycle to those persons with knowledge of the applicable number. When the Connect operation has been executed the following two options are available.

10.5.2.1 Read

Allows the stored codes to be interrogated and displayed in a box on the screen.

10.5.2.2 Reset

Resets the two codes to default values.

The default values will be displayed, but for reference they are:

Fan functions locking code: 1111

Vapouriser function access code: 2222

The configuration of different codes must be carried out from the controller keypad once communication between controller and computer has been broken. To break the link, click on the **(Dis)connect** button.

Note:

The current status of the communication link between the PC and the controller is indicated by the graphic on the **(Dis)Connect** button. When the communication link is disconnected the two connectors are shown separated; when connected they are together.

The status of the communication link should not be confused with physical condition of whether the cable is connected or not, e.g. the cable may be connected but the communication link may not be made.

10.5.3 Comm Port

The **Comm Port** menu options allow the selection of either COM1 or COM2 (serial) ports on the computer to be used for communication to the controller. By default, COM2 will be selected but the assignment can be changed to COM1 by clicking on the appropriate text.

If a portable computer is used for setting up, the use of COM1 is likely to be the only serial port available for external connections. Thus, it will be necessary to make this selection before connection to the controller can be made.

10.5.4 Options

Selecting **Options** allows enabling of the following two facilities.

10.5.4.1 Direct Control

When selected, the fan speed slider (area 9 of Fig. 13) can be used to directly adjust the Exhaust fan speed. This is useful primarily during the calibration process described in the next section.

10.5.4.2 Show Sensors

When selected, numerically scaled sensor output values are displayed in area 7 of Fig. 13.

10.6 MISCELLANEOUS FUNCTIONS

10.6.1 (Dis)Connect

This button serves both the functions of connecting and disconnecting the communication link between the PC and Controller. The current status of the communication link between the PC and the controller is indicated by the graphic on the (Dis)connect button.

When the communication link is disconnected the two connectors are shown separated, when connected they are together.

10.6.2 Read

Although all setup parameters are automatically (read from the controller and) displayed on the screen whenever a Connection is made, **Read** will repeat this function. **Read** is therefore used after a variable has been changed and written to controller memory for example, and it is subsequently required to check the controller's current settings.

10.6.3 Calibrate

The calibrate button initiates the calibration cycle which is explained in Section 11 'Calibration of Airflow and Alarms'.

10.6.4 Clear all

Clicking on the Clear all button will reset all fields on the setup screen to their default values. Commonly, default values are zero.

10.6.5 Write

The Write function will load all current screen parameters to the controller memory.

11 CALIBRATION OF AIRFLOW AND ALARMS

11.1 INTRODUCTION

The setup software Calibrate facility allows calibration of the cabinet airflows and alarms. This option will allow downflow and inflow alarms to be set, together with the operating speed for the cabinet. It is then this speed that the control system will use as a reference and always attempt to maintain. The cabinet airflow can be set up to comply with EN12469:2000 or another criteria and the requirements/procedures are described in the following paragraphs. Note that re-circulatory cabinets are set-up accurately with a calibrated rig giving accurate inflow and downflow readings. Site calibrations will always be less accurate, so it is important to double check before altering any settings.

11.2 EQUIPMENT REQUIRED

- A hot wire anemometer or a 100mm Dia Paddle wheel anemometer can be used.
- A Laboratory stand to hold the anemometer
- Multimeter
- Laptop Computer with V1.00 Calibration software Installed
- Communication Cable see section 10.2

11.3 AIRFLOW REQUIREMENTS

The inward airflow velocity through the working aperture shall be between 0.7 and 1.0 m/s.

11.4 CALIBRATION PROCEDURE

Calibration ought only to be carried out by a suitably trained Technician. The 'Calibrate' process will instruct the operator to set the airflow via a (virtual) slider on the screen to the two alarm velocities of: low and high In Flow. These values will then be used by the set-up software to derive an operating condition for the cabinet such that no alarms will be activated. When the data is written to the controller, the values will be stored and used until the cabinet is next calibrated or adjusted. The operating condition of the cabinet can be manually adjusted if desired.

To calibrate the cabinet, proceed as follows:

If communication between the computer and controller is not made, click on **(Dis)Connect** (area 11, Fig. 13).

It is not unusual to see a dialog box saying “Controller not configured correctly, please configure”. Disregard this message as the following process will configure the controller.

11.4.1 Initial Set-up and measurement of inflow

Configure the cabinet in Class I mode. Place the head of the anemometer at the geometric centre of the front aperture in the vertical plane and in line with the edge of the glass, wait for at least one minute for the reading to stabilise and then record, then place the anemometer at each of its four corners with the centre of the anemometer between 50mm and 55mm from the side and top or bottom. The average of these five readings is the figure which ought to be used for the inflow. The window should be secured in the working position. If necessary, place a draft exclusion screen in front of the unit under test.

Select **(Dis)Connect** to connect the unit under test. Adjust the Fan Speed Slider until a reading of 0.85 m/s (170 ft/min) is obtained, then allow the unit to settle for five minutes. Move the anemometer head to the four corners of the working aperture and record the reading along with the geometric centre (three readings along the geometric centre on 1.5m units). Establish the mean and place the anemometer head in the position closest to the mean.

Click on **Calibrate** (area 11, Fig. 13). The configuration file opening screen will then appear. Select the default file 'default.cfg', double click on the appropriate text.

11.4.2 Low Inflow

A dialogue box will now appear (see Fig. 14).

The value of velocity the instruction specifies to set will be the value retrieved from the configuration file. With the anemometer at the position defined in 11.4.1, adjust the fan to give the value of 0.7 m/s (140 ft/min). Adjustment is made by dragging the Fan Speed Slider on the calibrate screen. Alternatively, for small increments, the bar either side of the slider may be clicked, or for the smallest adjustment, either direction arrow may be clicked.

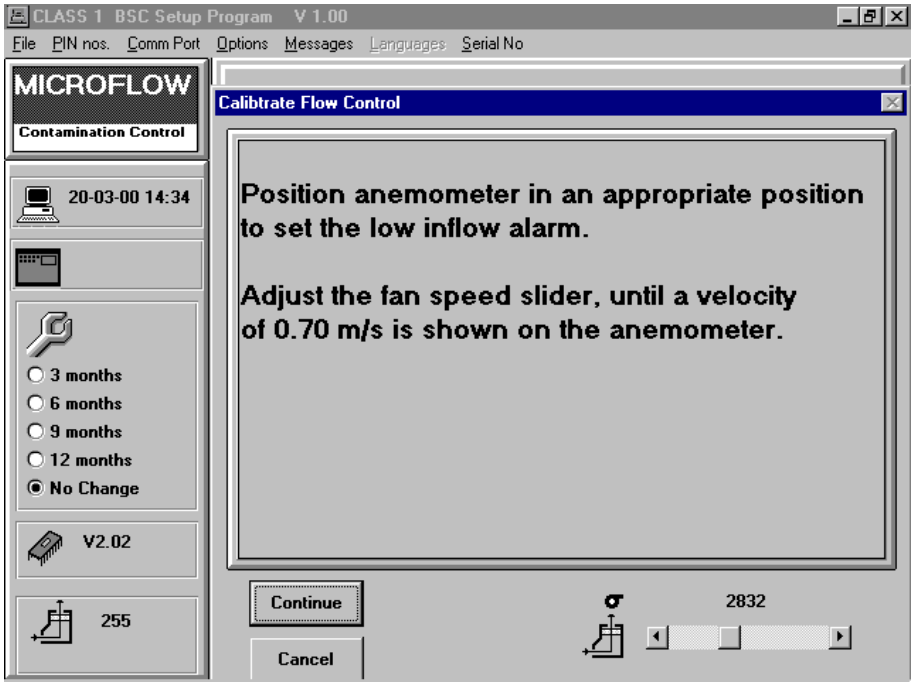


Figure 14 0.7 m/s, Low Inflow Alarm Setting

When the correct speed has been obtained as indicated on the anemometer, although the software waits until sensor values are stable, it is advisable to observe the sensor values until the numbers are steady before clicking **Continue**.

Click on the **Continue** button. A new dialog box will appear, "Please wait for Stabilisation" see Fig. 15. Wait until this clears, if this fails to clear within 10 minutes, there is a problem with the flow sensor as it is not stabilising, seek technical assistant.

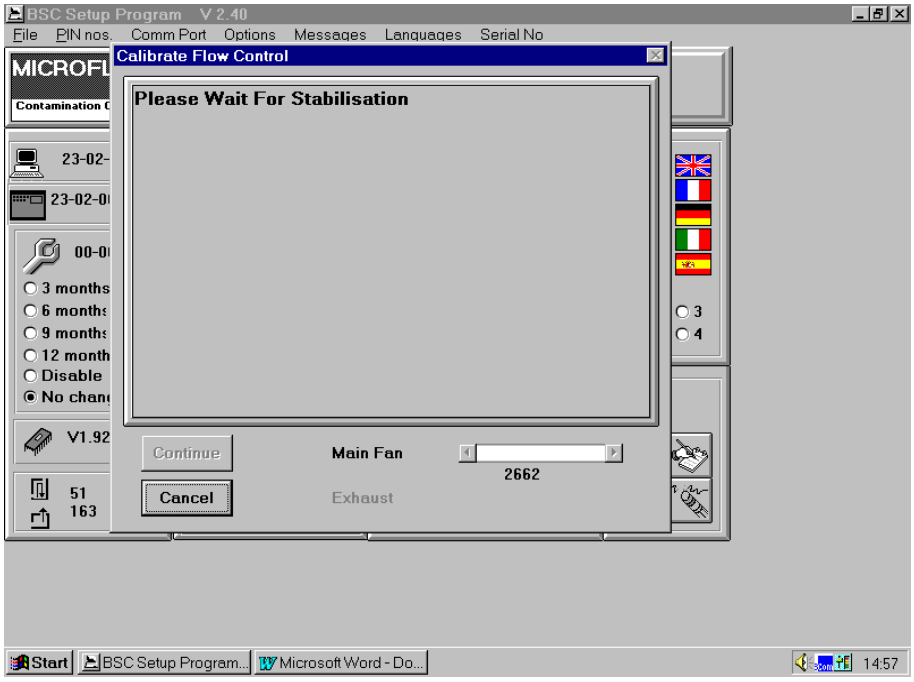


Figure 15 "Please Wait for Stabilisation" Dialog Box

12.1.6 High Inflow

A new dialogue box will now appear, similar to Fig. 15 but with 1.0 m/s as the value of velocity the instruction specifies to set will be the value retrieved from the configuration file. With the anemometer at the position defined in 11.4.1, adjust the fan to give the value of 1.0 m/s (198 ft/min). Should the voltage to the fan exceed 195 V ac, it is recommended to NOT to set above this figure. Dragging the slider next to Main fan speed title on the sub screen makes adjustment. Alternatively, for small increments, the bar either side of the slider may be clicked, or for the smallest adjustment, either direction arrow may be clicked.

When the correct speed has been obtained as indicated on the anemometer, although the software waits until sensor values are stable, it is advisable to observe the sensor values until the numbers are steady before clicking **Continue**. Click on the **Continue** button. A new dialog box will appear, "Please wait for Stabilisation" see Fig. 15. Wait until this clears, if this fails to clear within 10 minutes, there is a problem with the flow sensor as it is not stabilising, seek technical assistant.

After the two alarm points have been set, a dialogue box, see Fig. 16, will offer the choice either to Continue which will store the data to the controller's memory, or to Cancel the calibration process. If the latter is selected then flow settings and alarm values in the controller's memory will remain unchanged.

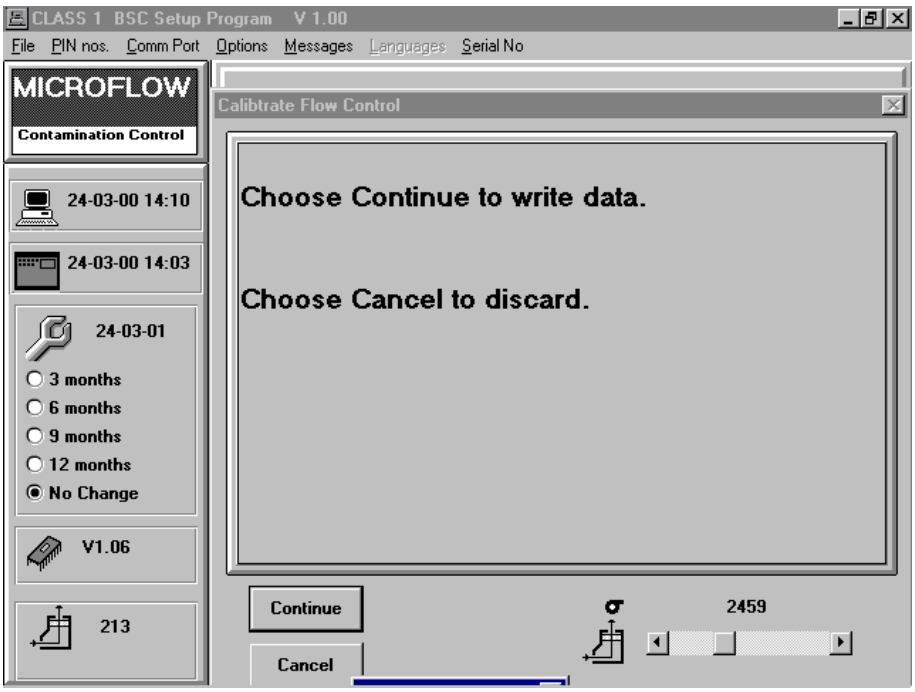


Figure 16 "End of Calibration" Dialog Box

Click on **Continue** and, after a short period, a new dialogue box will appear "Calibration Complete". Press "OK". Another screen will appear saying "Data written to controller" press "OK" button. Should the message appear "Write

failed, try again" with two buttons "Yes" and "No". This message does not necessarily mean that it has actually failed. Press "NO"

Calibration is now complete break the communication link between the PC and controller by clicking **(Dis)Connect** button.

Note:

If new setup parameters (different from configuration files already stored on the PC's disk) are required to be saved for future use, this operation should be carried out before **(Dis)Connect**ing. To save a configuration file, edit all variables to the figures required on the screen then execute the file interface. Finally, click on **Save**. For further details see Section 10.5.1 'File'.

12 TROUBLE SHOOTING

Fault/Alarm	User Action
Fan and light do not operate	Check Mains Power Indicator is illuminated, if not: • Check power to unit • Check isolator switch adjacent to mains supply input socket is ON
Inflow High or Low Alarms	Check for obstructions on the exhaust outlet or at the window access at the front, if none: Mute alarm, switch off cabinet and contact service provider
Replace Filters	Mute alarm, switch off cabinet and contact service provider
Screen LH or RH unlocked	Check left and right hand latches have engaged correctly, adjust if required Check magnets are in position Check screen is at working height – if screen is above or below working height marks – screen stop may require adjustment (located behind main front cover)
Fan 100%, Battery Fail	Switch off cabinet and contact service provider
No Gas supply	Check control panel display is indicating SAFE. If it is switch off cabinet and contact service provider
UV Light not working (Portable)	Check magnet is located on front screen and is in line with switch on UV light unit Check light unit is positioned correctly onto front grill
UV Light not working (Fixed)	Replace UV tube, if still does not work contact service provider
Lights are not working	Replace light tubes, if still does not work contact service provider
Vaporizer not working	Incorrect PIN number, contact service provider to reset PIN.

13 SPARES

Refer to the Supplier or the Maintenance Provider for a comprehensive list of spares. Below are the most common parts requested:

MODEL	ABS 1000	ABS 1200	ABS 1500
Main Filter	MSABS1000-031	MSABS1200-031	MSABS1500-031
Integral Bypass Filter	MSABS1000-030	MSABS1200-030	MSABS1500-030
Electronic Ballast	H12010020	H12010016	H12010021
Light Tubes	H12010018	H12010015	H12010019
UV Tubes	262-5005	262-5004	262-5004
Gas Springs	754-1023	754-1026	754-1022
Door Seal	TM021-0014	TM022-0014	TM025-0014

ITEM	QTY. USED	DESCRIPTION	PART No.
Main Fan (230V) (Recirc)	1	Motor Fan Unit complete with Capacitors	450-2050
Exhaust Fan Unit	1	Fan at end of duct (standard version)	AMM20663E/W
Starters for UV	1	Starter	257-0381
Fuses	2	10 A Antisurge	271-4719
Fuses	3	6.3 A Quick Blow	EHB 10342 E
Fuses	1	2 A Antisurge	EHB 10374 E
Fuses	2	1 A Quick Blow	EHB 10437 E
Fuses	1	100 mA Antisurge	EHB 10174 E
Fuses	1	1 A Antisurge	EHB 10440 E
Circuit Breakers	1	Double Pole Circuit Breaker/Switch (2.5 A)	250-0010
ABS PCB	1	Main circuit board	259-0994
ABS Top Box Duct Spigot	1	Duct Spigot	TM029-0003

SPARES LIST - AUTOMATIC FUMIGATION SYSTEM

ITEM	QTY. USED	DESCRIPTION	PART No.
Filter	1	Carbon	ABS 013
Fan	1	230 V 50 Hz	450-2053
Valve Flap	2	Rubber	550-9000
Valve Solenoid	2	230 V 50 Hz	3225-100001

14 SERVICING RECORD

DATE	ACTION	COMPLETED BY

15 EC DECLARATION OF CONFORMITY

EC DECLARATION OF CONFORMITY FOR ATTACHMENT OF 'CE' MARK

CE

We, the manufacturer: BIOQUELL UK Limited.
52 Royce Close
Portway Industrial Estate
Andover, Hampshire
SP10 3TS
Tel: +44 (0) 1264 - 835835
Fax: +44 (0) 1264 - 835836

Declare under our sole responsibility that the appliance:

ABS CLASS I Microbiological Safety Cabinet
Model Numbers, 1000, 1200, 1500,

Serial Number as stated on Certificate of Factory Testing

Complies with the Protection Requirements of the Electromagnetic Compatibility Directive 2004/108/EC, and the Machinery Directive 2006/42/EC by means of the following harmonised standard:

BS EN 61326-1:2006

Tested By: TRaC, Holly Grove Farm,
Verwood Road, Ashley, Ringwood, Hants, BH24 2DB –
Certificate No. 5790/04 +
Certificate No. 6622/09

Other harmonised standards used:

EN 61010 : 2001

Responsible Person :-

Name :- ***O.R.Cumberlege***

Position :- ***Director***

Signed:-

Date:- 10th March 2010.

16 APPROVED SERVICE COMPANY

We only recommend BIOQUELL, in the UK or its local service provider to carry out service and repair work. These technicians have been fully trained on the product.

To contact BIOQUELL use one of the following methods:

- Call the Service Desk on 01264 835 800 or 0800 527800
- Fax to 01264 835 801
- E-mail to enquiries@bioquell.com

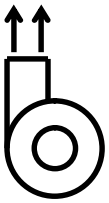
For details of our local service providers outside the UK contact BIOQUELL on +44 1264 835 800

17 SAFETY SYMBOLS

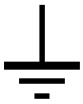
BIOHAZARD

CAUTION

CAUTION, RISK OF ELECTRIC SHOCK

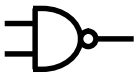


FAN

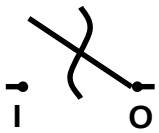


EARTH (GROUND) TERMINAL

PROTECTIVE CONDUCTOR TERMINAL



POWER



ON/OFF

18 WARRANTY

BIOQUELL UK Ltd. produces products that are warranted under normal usage against defects in workmanship and materials for one-year parts and labour costs, from the date of manufacture. The Warranty is stated in the Standard Terms and Conditions of sale.

Export and Agent retailed products are warranted directly by the Agent. Please confirm your warranty and liability status with the Agent.

In addition, the Warranty is void unless the following conditions are met:

(a) The product has been installed and used as stated within the Instruction Manual.

(b) **The warranty does NOT include servicing or maintenance.** An approved service company who have attended our training courses for your product must carry out maintenance of product. Failure to maintain or service this product will invalidate the warranty. Maintenance must be carried out in accordance with the Service Manual and include tasks within stated periods. Failure to use approved service companies or BIOQUELL UK Ltd. trained personnel for maintenance also affects the CE Marking status of the product, removing BIOQUELL's Duty of Care and responsibility

(c) Consumables such as: pre-filters, HEPA filters, light bulbs and tubes, not warranted.

(d) This Warranty is void if faults are caused by accidental damage, mishandling, adjustment by unauthorised personnel or failure to follow the correct maintenance and safety precautions as stated in the Instruction Manual.

(e) The Warranty expressly provided for herein is the sole Warranty provided in connection with the product and no other Warranty, expressed or implied, is provided. BIOQUELL UK Ltd. assumes no responsibility for any other claims, consequential (including lost time or profit) or other damage, whether based in contract, tort or otherwise, not specifically stated in this Warranty.

(f) Except in respect of death or personal injury caused by Seller's negligence, or as expressly provided in these Conditions, Seller shall not be liable to Buyer by reason of any representation (unless fraudulent), or any implied warranty, condition or other term, or any duty at common law, or under the express terms of the Contract for any loss of profit or any indirect, special or consequential loss, damage, costs, expenses or other claims (whether caused by the negligence of Seller, its servants or agents or otherwise) which arise out of or in connection with the supply of the Goods or their use or resale by Buyer, and the entire liability of Seller under or in connection with the Contract shall not exceed the price of the Goods.

Note:
When requesting a Warranty visit, please have the following information available:

(i) Product model number and name.

(ii) Serial number.

(iii) Date of last service, and Service Company.

(iv) Nature of fault and any other comments likely to indicate cause of fault.

(v) A Purchase Order number to cover costs incurred if visit is outside the scope of the Warranty.

BIOQUELL UK Ltd., or other nominated personnel will carry out warranty visits.

(g) In the event of any health and safety incidents please advise us in writing at the earliest opportunity.

(h) This warranty and all other contractual issues shall be governed by English law and the parties agree to submit to the nonexclusive jurisdiction of the courts of England.